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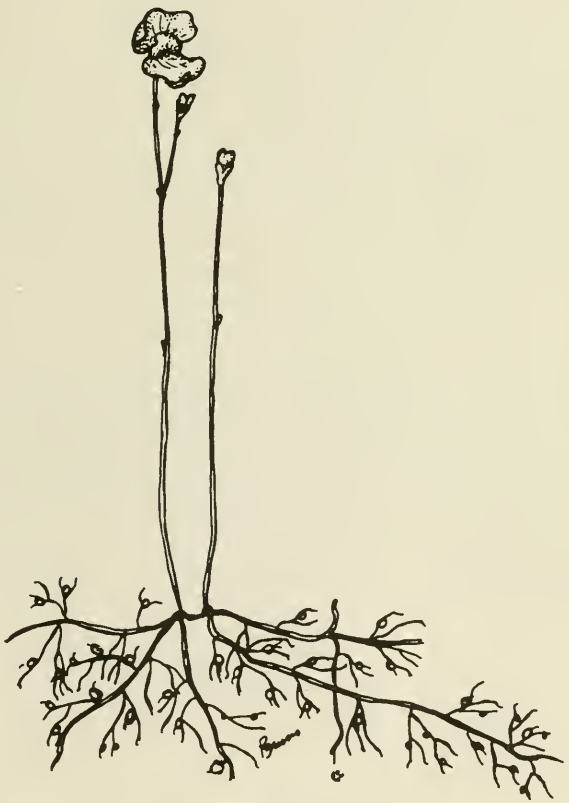
Aquatic Vascular Plants of New England: Part 8. Lentibulariaceae

by

G. E. Crow and C. B. Hellquist



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We wish to thank Drs. Robert K. Godfrey and George B. Rossbach for their helpful comments on the manuscript. We are also grateful to the curators of the following herbaria for use of their collections: BRU, CONN, CUW, GH, NHN, KIRI, MASS, MAINE, NASC, NCBS, NHA, NEBC, VT, YU. A special thanks is extended to Pamela Bruns Brayton who prepared the illustrations. Gratitude is expressed to the University of Wisconsin Press for permission to use or redraw several figures from Fassett's *Manual of Aquatic Plants*.

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ABSTRACT

This paper is the eighth in a series of reports on the aquatic and wetland flora of New England. It treats all species of the Lentibulariaceae occurring in New England and includes keys, comments on taxonomy and nomenclature, habitat and distributional information, water chemistry data, illustrations and dot maps. Those species regarded as rare and endangered in the New England Region or in one or more of the six New England States are also noted.

KEY WORDS: Aquatic Plants, New England Flora, Taxonomy, Lentibulariaceae, *Utricularia*, Bladderwort.

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Aquatic Vascular Plants of New England: Part 8. Lentibulariaceae

by

G. E. Crow and C.B. Hellquist

INTRODUCTION

This is the eighth in a series of reports on the aquatic and wetland flora of New England. These reports are intended to aid conservationists, fish and game personnel, consultants, botanists, and students in the identification of aquatic plants. The coverage is strictly New England but is of value throughout the northeast. Data have been gathered from herbaria in New England and from personal field work.

Chemical data presented represent samples from many waters throughout New England. The alkalinity readings are total alkalinity, expressed as milligrams per liter (mg/l) $CaCO_3$. The number of observations is given in parentheses following alkalinity and pH values. Since pH and alkalinity vary greatly during the day, the values are only indicative of the water quality.

The rare and endangered plant lists referred to are those prepared for each of the six New England states by the New England Botanical Club in cooperation with the United States Fish and Wildlife Service, Office of Endangered Species, Newton Corner, MA (RI — Church and Champlin, 1978; MA — Coddington and Field, 1978; VT — Countryman, 1978; ME — Eastman, 1978; CT — Mehrhoff, 1978; NH — Storks and Crow, 1978). Taxa indicated as rare, threatened or endangered for the entire New England Region are also noted (Crow *et al.*, 1981, Rhodora 83: 259-299.)

We invite comments and/or criticisms on this treatment. Information on any species omitted or any additional localities will be welcomed. If anyone is interested in specific localities of any of the species indicated on the dot maps, please contact us.

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Dr. C. Barre Hellquist, Department of Biology, North Adams State College, North Adams, MA 01247.

LENTIBULARIACEAE

Utricularia (Bladderwort)

Perennial aquatic herbs; plants consisting of stem systems, roots absent; lateral leaf-like branches green, usually bearing bladder-like carnivorous traps, bladders sometimes borne on separate, non-photosynthetic branches; flowers borne on scapes elevated above water surface, solitary or in racemes; fruit a 2-valved capsule; perennating by winter buds (turions).

Key to Species

1. Plants floating in the water or creeping over surface of substrate (sometimes appearing anchored).
   2. Plants with two distinct types of branches, green leaf-like branches lacking bladders, and bladder-bearing branches lacking chlorophyll, sometimes appearing anchored in substrate (figs. 1A,2A).
      3. Segments of leaf-like branches fine, becoming narrower with each dichotomy, ultimate segments thread-like, not toothed (fig. 1B); corolla pale-yellow to greenish-yellow, lower and upper lips nearly equal (fig. 1A).
         ..... 1. *U. fibrosa*
      3. Segments of leaf-like branches distinctly flat, segments remaining approximately the same width, divisions minutely toothed (fig. 2B); corolla bright yellow, lower lip nearly twice as long as upper lip (fig. 2A).
         ..... 2. *U. intermedia*
   2. Plants with branches all alike, leaf-like, bearing bladders.
      4. Flowering scapes subtended by a whorl of inflated branches, floats holding the flowers above the water surface (fig. 3A).
         ..... 3. *U. radiata*
      4. Flowering scapes not subtended by inflated branches (floats).
         5. Leaf-like branches all whorled (fig. 4F); bladders borne at tips of branches (fig. 4F); flowers purple (rarely albino).
            ..... 4. *U. purpurea*
         5. Leaf-like branches chiefly alternate; bladders borne scattered on branches; flowers yellow.
            6. Leaf-like segmens flat; spur of corolla very short, saccate, almost absent.
               ..... 5. *U. minor*
            6. Leaf-like segments terete; spur of corolla 3 mm or more long.
               7. Leaf-like branches divided 6 or more times; free-floating; plants large, stout, 30-100 cm long.

8. Scapes with 2-5 flowers; bracts subtending flowers unlobed; submersed, bladder-bearing branches often with small, apetalous cleistogamous flowers (fig. 4D); branches finer, segments entire, except for small spicules at tips (magnification needed).
..... 6. *U. geminiscapa*

8. Scapes with 6-12 flowers; bracts subtending flowers with basal lobes; cleistogamous flowers absent; branches coarser, segments with spicules along margins (fig. 4B) (magnification needed).
..... 7. *U. vulgaris*

7. Leaf-like branches divided 1-3 times; creeping over wet mud or in shallow water, or in tangled masses floating in shallow water; plants small, slender, less than 30 cm long.

9. Flower spur much shorter than lower lip of corolla, thick, obtuse, 3.0-3.5 mm long (fig. 1F); lower lip of corolla 5-6 mm long; leaf-like branches with mostly 2 segments.
..... 8. *U. gibba*

9. Flower spur somewhat shorter to slightly longer than lower lip of corolla, narrow, conic, usually curved, more than 4 mm long; lower lip of corolla 8-10(-15) mm long; leaf-like branches with 3 or more segments (usually forked twice).
..... 9. *U. biflora*

1. Plants anchored in substrate, apparent only when flowering, appearing terrestrial (vegetative grass-like branches sometimes emergent, or sometimes floating in densely tangled mats due to wave action (fig. 5I).

10. Flowers yellow (rarely purplish or white); bracts along scape alternate (fig. 5A,D); flowers (1-)2-12.

11. Flowers clearly pedicellate; bract at base of pedicel peltate (fig. 5B); spur of corolla appressed to lower lip (fig. 5C).
..... 10. *U. subulata*

11. Flowers subsessile; bract at base of flower attached basally (fig. 5E); spur of corolla divergent (fig. 5D).
..... 11. *U. cornuta*

10. Flowers purple; bracts along scape paired, fused (fig. 5F,G); flowers 1.
..... 12. *U. resupinata*

1. *Utricularia fibrosa* Walt. Fig. 1, Map 1

Rare in pools, wet peat, and long sandy shores of southeastern Massachusetts. This species is easily confused with *U. biflora*, but is more robust and has two distinct branch types, one with bladders and one without. Range extends from southeastern Massachusetts and central Connecticut south along the Coastal Plain to Florida and along the Gulf Coast to eastern Oklahoma and eastern Texas; California.
Rare and endangered plant lists: New England, Massachusetts, Connecticut

2. *Utricularia intermedia* Hayne Fig. 2, Map 2

Common in shallow water, peaty soils, and damp sands throughout New England. Although more abundant in acidic waters this species is often found in moderately alkaline waters. The green, leaf-like branches above the substrate lack bladders, hence the plant may not be readily recognized as a bladderwort until the plant is removed from the substrate and the bladders observed. Range extends from Greenland, Newfoundland, and Nova Scotia west to Alaska, south to New England, Long Island, New York, northern Delaware, Pennsylvania, Ohio, northern Indiana, northern Illinois, northwestern Iowa, and California.

alkalinity: mean 9.7 mg/l; range 3.5-52.5 mg/l (17)
pH: mean 6.7; range 5.9-7.9 (17)

3. *Utricularia radiata* Small Fig. 3, Map 3

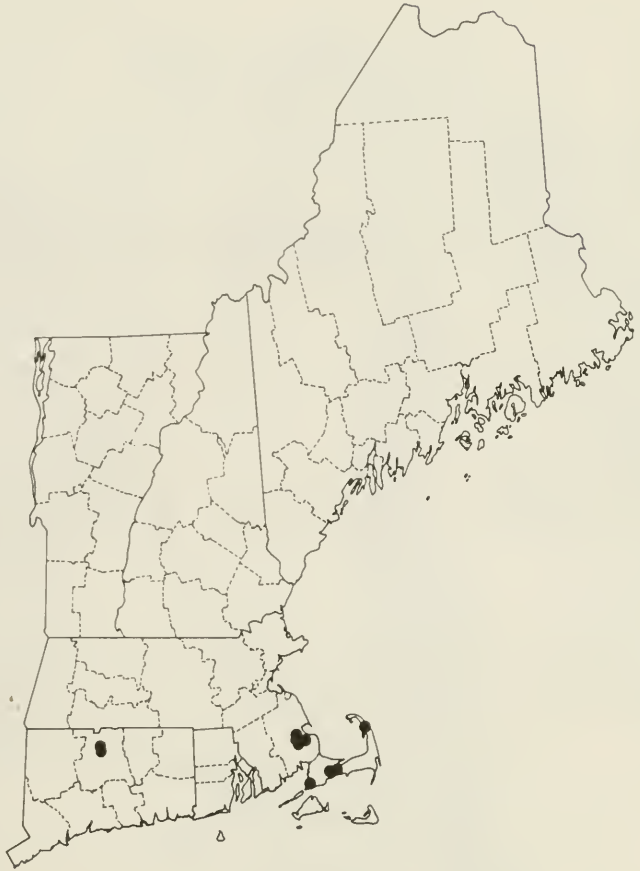
Common in acidic waters of southern New England, widely scattered in northeastern New England. This taxon is treated by some authors as *Utricularia inflata* Walt. var. *minor* Chapm., but Reinert and Godfrey (1962) regard it as a distinct species from the more robust *Utricularia inflata* Walt. of the southeast. This taxon is easily identified in the flowering state, but sterile, submersed material is occasionally difficult to identify. Range extends from Nova Scotia and New England south along the Coastal Plain to southern Florida and westward along the Gulf Coast to eastern Texas; westward inland to Pennsylvania, northwestern Indiana, West Virginia, and Tennessee.
Rare and endangered plant list: Vermont

alkalinity: mean 7.8 mg/l; range 1.0-33.0 mg/l (26)
pH: mean 6.6; range 5.6-7.3 (27)

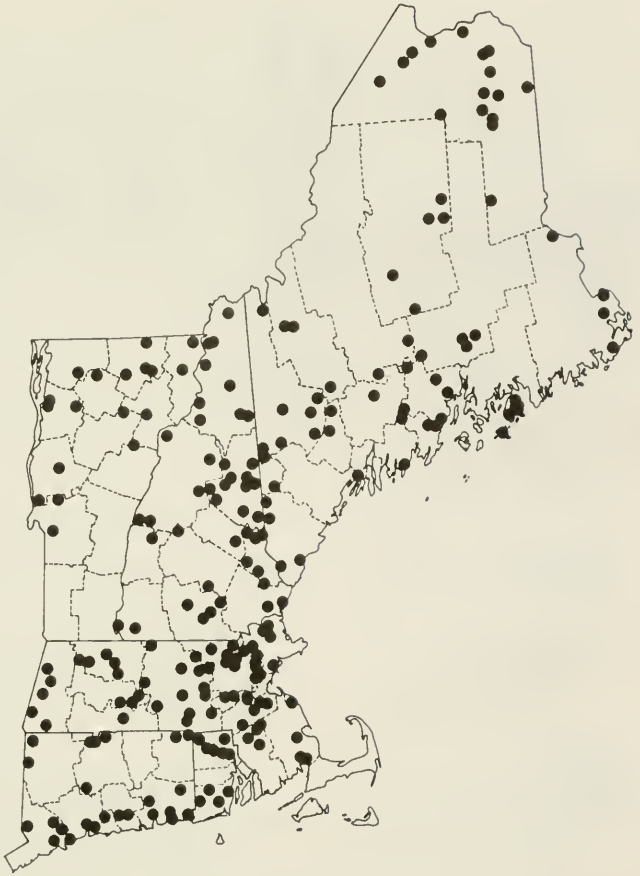
4. *Utricularia purpurea* Walt. Fig. 4, Map 4

Common, free-floating in acidic waters of eastern and southern New England, rarely in moderately alkaline waters. This species often flowers sporadically in many populations while flowering regu-

Figure 1
Utricularia fibrosa: A. habit × 1. B. leaf-like branch × 4. C. spur of corolla × 2, redrawn from Fassett.
Utricularia biflora: D. habit × 1. E. spur of corolla × 2, redrawn from Fassett.
Utricularia gibba: F. habit × 1.



Map 1
Utricularia fibrosa



Map 2
Utricularia intermedia

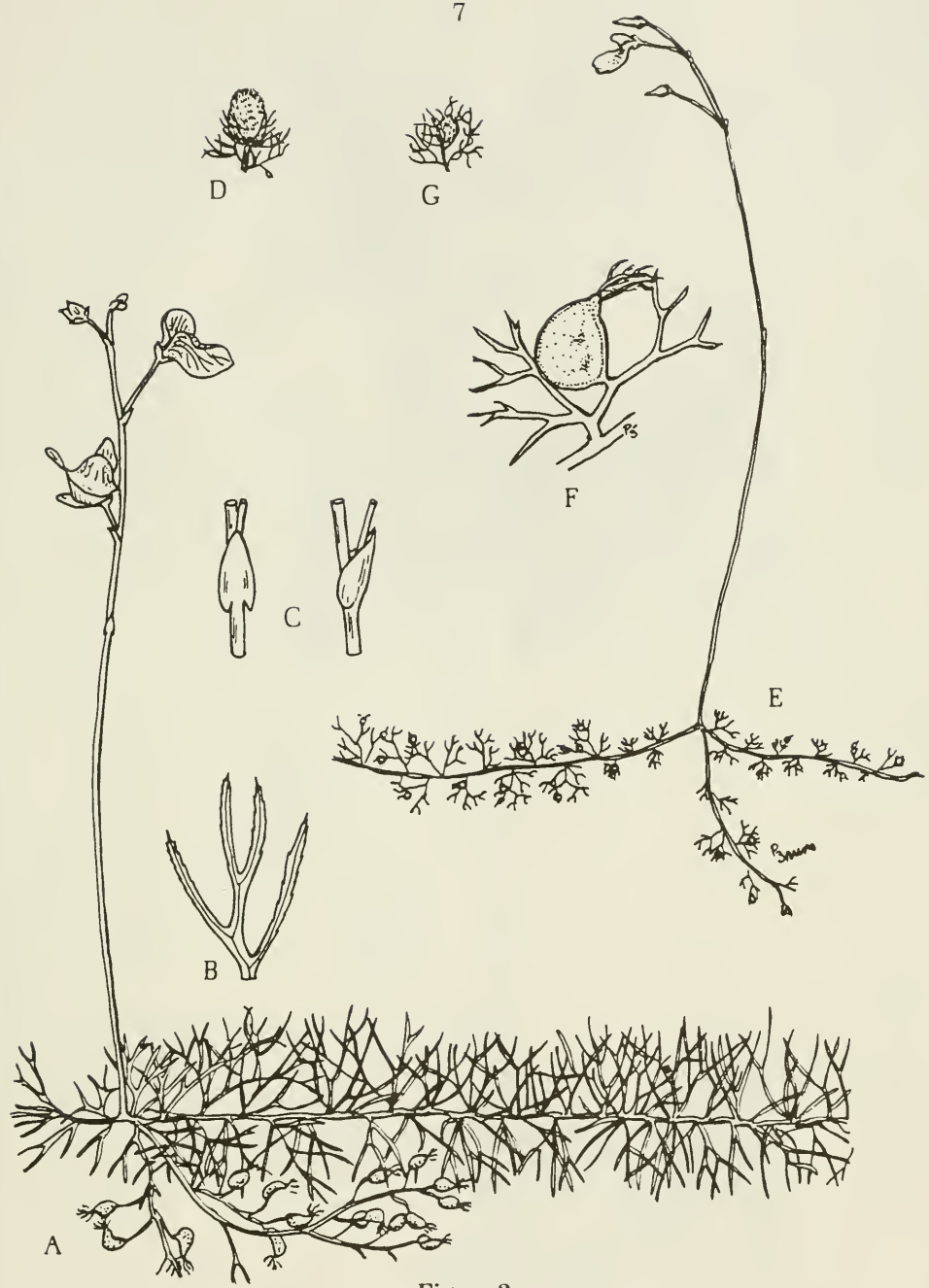


Figure 2

Utricularia intermedia: A. habit × 1. B. portion of leaf-like branch lacking bladders × 8. C. bract, side and back views, × 4. D. winter bud × 1. All from Fassett. *Utricularia minor:* E. habit × 1. F. portion of leaf-like branch bearing bladder × 10. G. winter bud × 1, from Fassett.

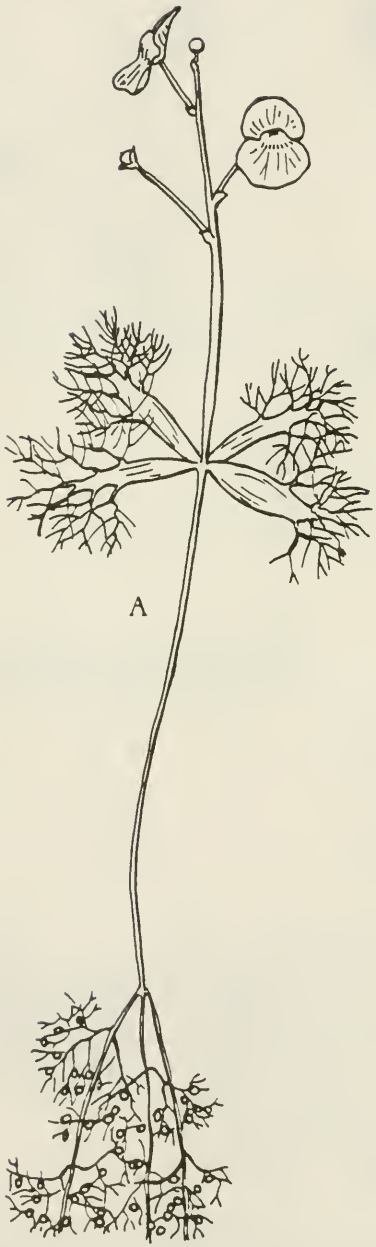
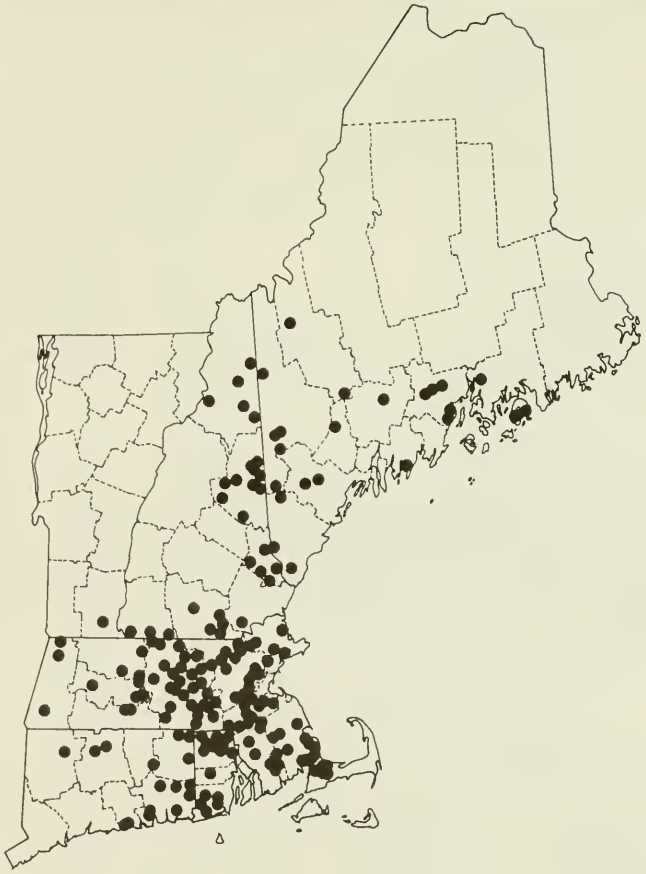
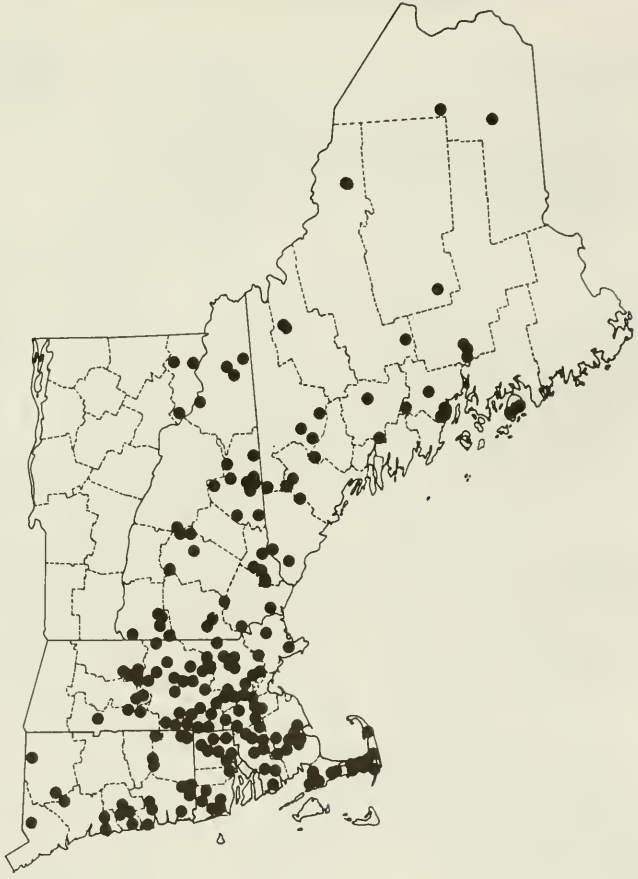


Figure 3
Utricularia radiata: A. habit × 1, redrawn from Fassett.



Map 3
Utricularia radiata



Map 4
Utricularia purpurea

larly and abundantly in others. The flower color ranges from purple to deep pink and rarely white (forma *alba* Hellquist). Range extends from Newfoundland, and Nova Scotia, west to southern Ontario, northern Indiana, Michigan, and Wisconsin, south along the Coastal Plain to Florida, Louisiana, and Texas.

Rare and endangered plant list: Vermont

alkalinity: mean 7.8 mg/l; range 2.5-33.0 mg/l (39)

ph: mean 6.6; range 5.6-7.3 (36)

5. *Utricularia minor* L. Fig. 2, Map 5

Widely scattered in acidic, alkaline, and slightly saline waters, wet meadows, bogs, and shores throughout New England. This species is rarely found in flower, but is easily identified by its flattened stems. Range extends from Greenland, Labrador, and Newfoundland west to British Columbia, south to Nova Scotia, New England, Long Island, New York, northern New Jersey, Pennsylvania, northern Ohio, northern Indiana, northern Illinois, northwestern Iowa, Nebraska, Colorado, and California.

Rare and endangered plant list: Vermont

alkalinity: mean 9.6 mg/l; range 3.0-33.5 mg/l (7)

pH: mean 6.9; range 6.0-8.1 (7)a

6. *Utricularia geminiscapa* Benj. Fig. 4, Map 6

Widely scattered in bog waters, acidic or moderately alkaline waters throughout New England. This species may be mistaken for a diminutive *Utricularia vulgaris*, thus flowering specimens are needed for accurate identification. Range extends from Newfoundland and New Brunswick west to Michigan and Wisconsin, south to New England, New York, eastern Pennsylvania, Delaware, and eastern Virginia.

Rare and endangered plant list: Vermont

alkalinity: mean 24.6 mg/l; range 5.4-69.5 mg/l (5)

pH: mean 6.7; range 3.5-8.6 (5)

7. *Utricularia vulgaris* L. Fig. 4, Map 7

Common and abundant throughout New England in acidic and alkaline waters. This is the most robust and common bladderwort in New England. Some stems range up to one meter in length. Range extends from southern Labrador west to Alaska, south to Virginia, North Carolina, Ohio, Indiana, Missouri, Oklahoma, and northern Texas; California and Mexico.

alkalinity: mean 18.6 mg/l; range 2.5-109.0 mg/l (75)

pH: mean 6.7; range 5.7-8.6 (70)

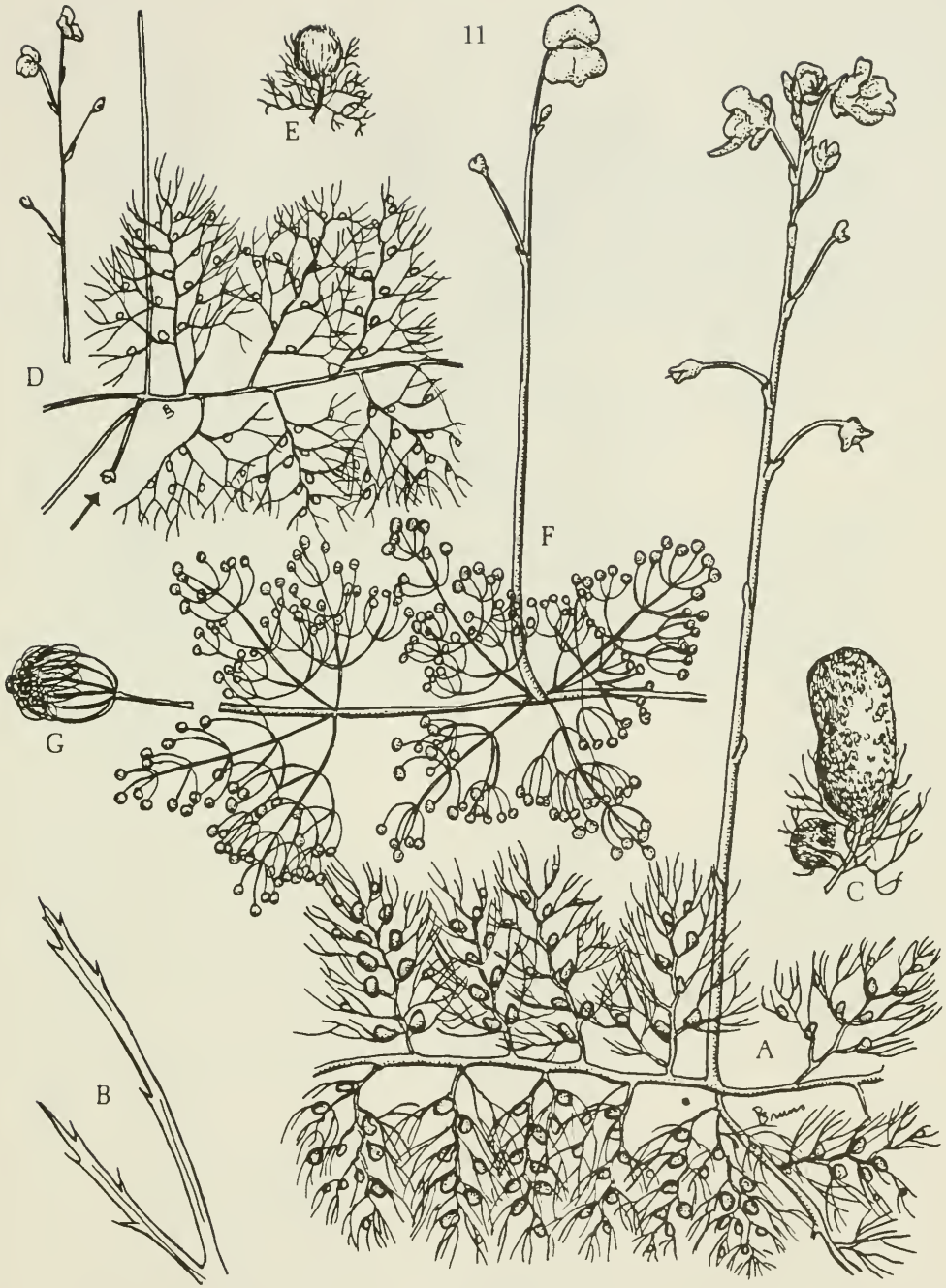
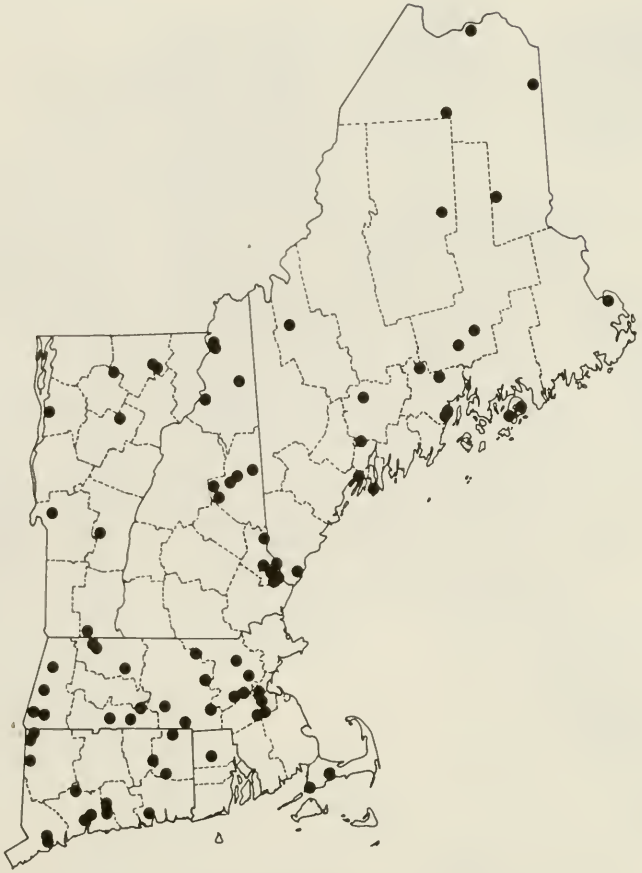


Figure 4

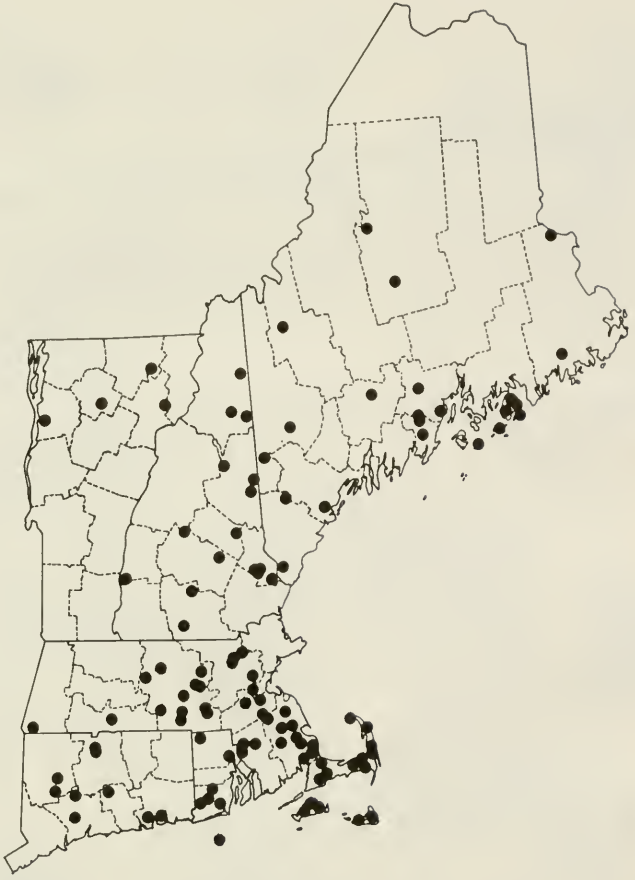
Utricularia vulgaris: A. habit × 1. B portion of leaf-like branch bearing spicules × 6. C. winter bud × 1, from Fassett.

Utricularia geminiscapa: D. habit (cleistogamous flower at arrow) × 1. E. winter bud × 1, from Fassett.

Utricularia purpurea: F. habit × 1. G. winter bud × 1.



Map 5
Utricularia minor



Map 6
Utricularia geminiscapa

8. *Utricularia gibba* L. Fig. 1, Map 8

Common in shallow water, bogs, and along sandy shores of southern New England, widely scattered in northern New England. In New England this species is much more abundant in acidic sites, while westward it is often found in wet marly sites of higher alkalinity. Range extends from Nova Scotia, southern Quebec, and New England west to New York, southern Ontario, Michigan, Wisconsin, and Minnesota, south to Florida, Oklahoma, and Texas; California and Mexico.

alkalinity: mean 15.6 mg/l; range 3.0-69.5 mg/l (16)
pH: mean 6.7; range 5.8-8.6 (14)

9. *Utricularia biflora* Lam. Fig. 1, Map 9

Rare in shallow pools, wet peat, and along sandy shores of southern New England. This species is easily confused with the more common *U. gibba* and the rarer *U. fibrosa*, and is somewhat intermediate between them. Range extends from the Coastal Plain of eastern Massachusetts, southern Rhode Island, and southern Connecticut south to Florida and west along the Gulf Coast to eastern Oklahoma and southeastern Texas.
Rare and endangered plant list: New England, Massachusetts, Connecticut

10. *Utricularia subulata* L. Fig. 5, Map 10

Rare in wet peats and sands in southeastern New England. Presently this species is known in New England from only two extant sites, one in southeastern Massachusetts and one on Nantucket Island. Range extends along the Coastal Plain from southwestern Nova Scotia, southeastern Massachusetts, Rhode Island, and Long Island, New York, to Florida and along the Gulf Coast to Texas; inland to Tennessee, Arkansas, and eastern Oklahoma.
Rare and endangered plant list: New England

11. *Utricularia cornuta* Michx. Fig. 5, Map 11

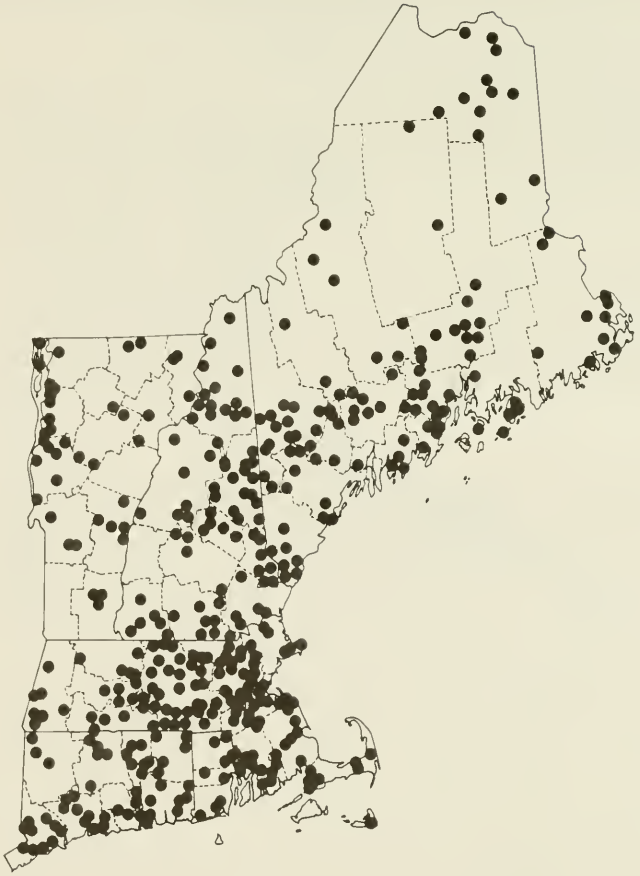
Common in sphagnum bogs, wet sands, and along sandy or peaty shores in New England. More abundant in acidic regions of New England, but also found in the alkaline regions of northeastern Maine and northern Vermont. This species is inconspicuous, except when in flower. The bladder bearing, subterranean vegetative material may be found floating in densely tangled mats after being washed free by wave action. Range extends from Newfoundland and Quebec west to northern Ontario, Wisconsin, and Minnesota, south to Dela-

Figure 5

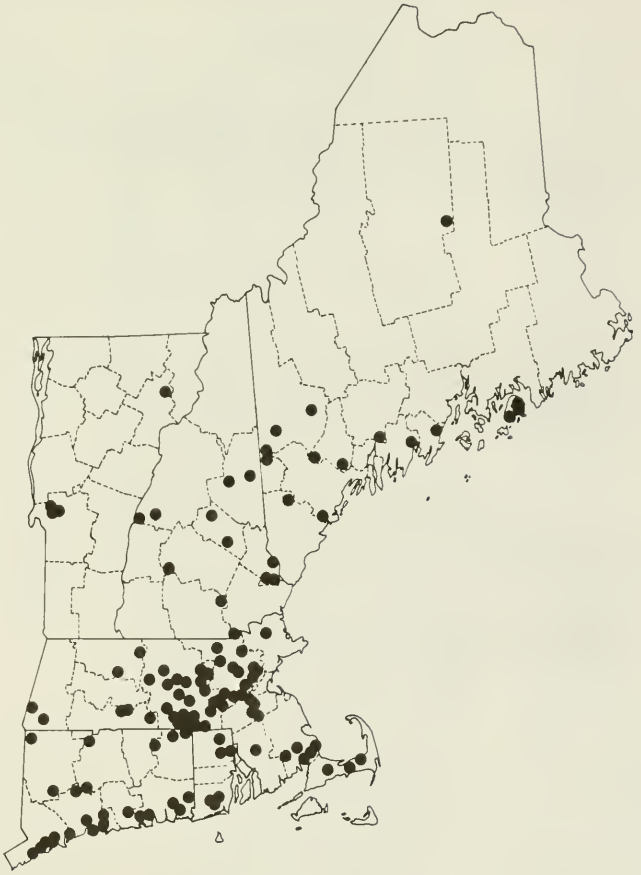
Utricularia subulata: A. habit showing subterranean bladder-bearing branches and vegetative grass-like branches × 1. B. peltate bract × 8. C. corolla showing appressed spur × 2.

Utricularia cornuta: D. habit showing subterranean bladder-bearing branches and vegetative grass-like branches × 1. E. bract × 4. Both from Fassett.

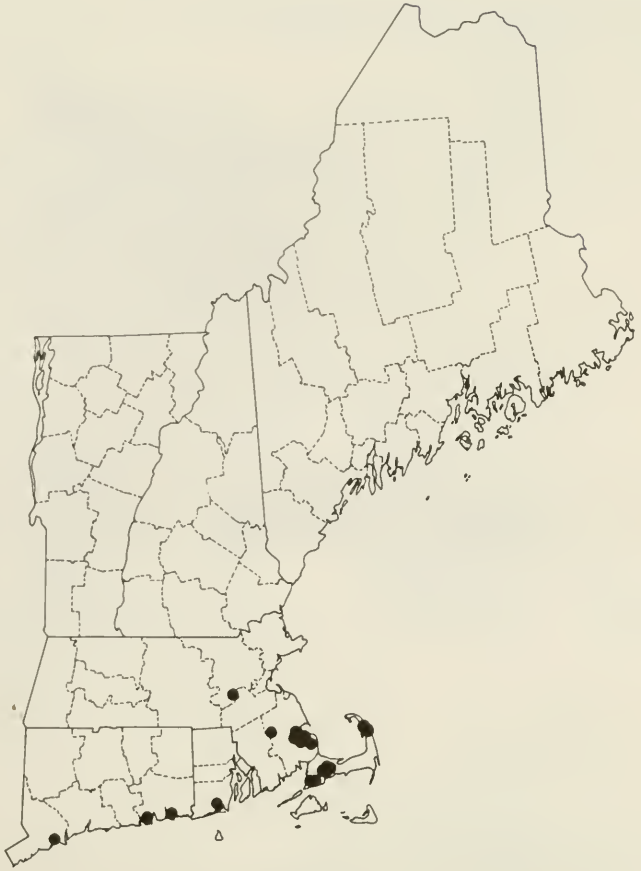
Utricularia resupinata: F. habit showing subterranean bladder-bearing branches and vegetative grass-like branches × 1. G. paired bracts × 4, from Fassett. H. corolla showing divergent spur × 2, from Fassett. I. mat of floating, densely tangled branches.



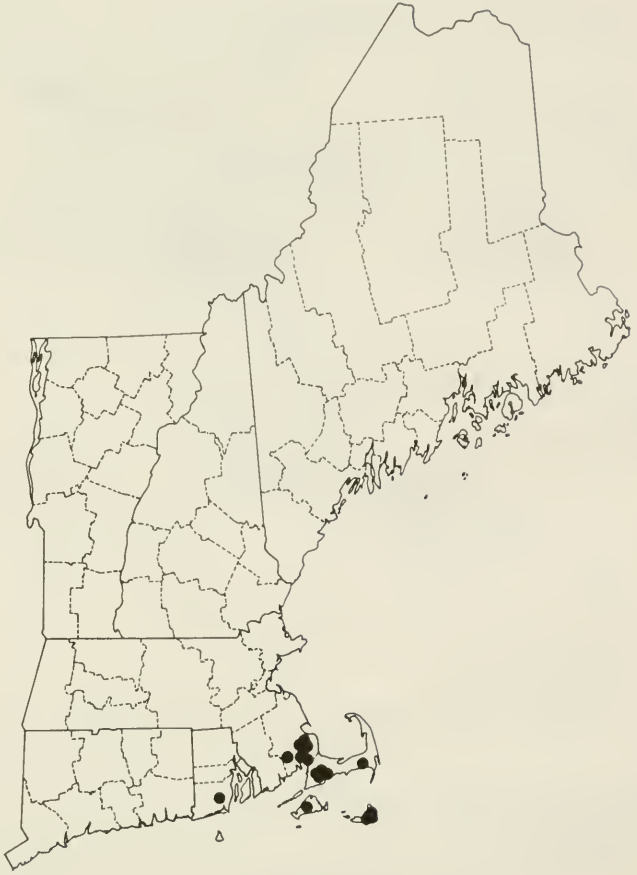
Map 7
Utricularia vulgaris



Map 8
Utricularia gibba



Map 9
Utricularia biflora



Map 10
Utricularia subulata

ware, Pennsylvania, Ohio, northern Indiana, and northern Illinois; along the Coastal Plain to Florida and eastern Texas.

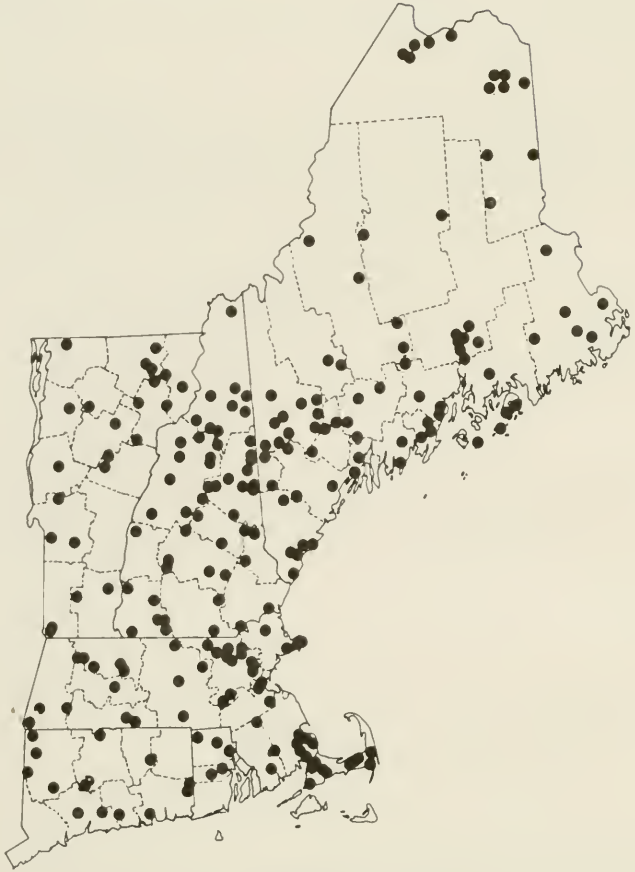
alkalinity: mean 3.7 mg/l; range 1.0-7.0 mg/l (6)

pH: mean 6.4; range 5.6-6.9 (6)

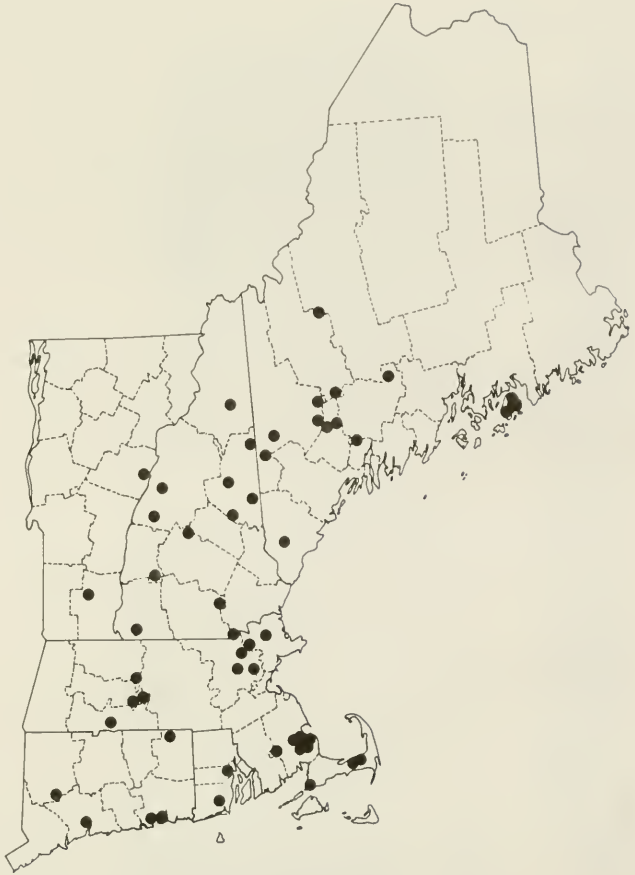
12. *Utricularia resupinata* B. D. Greene Fig. 5, Map 12

Uncommon in acidic regions of southern and central New England. This species, like *U. subulata* and *U. cornuta*, is difficult to identify in the sterile state and is usually overlooked. Many of the historical sites have been revisited to search for this species, but to no avail. This species seems to flower more often when the water recedes during dry seasons. Range extends from Nova Scotia west to Quebec, northern Michigan, and northwestern Wisconsin south to New York, northern Pennsylvania, northern Indiana, and northeastern Illinois; along the Coastal Plain to Georgia, Florida, and Alabama.

Rare and endangered plant list: Vermont



Map 11
Utricularia cornuta



Map 12
Utricularia resupinata

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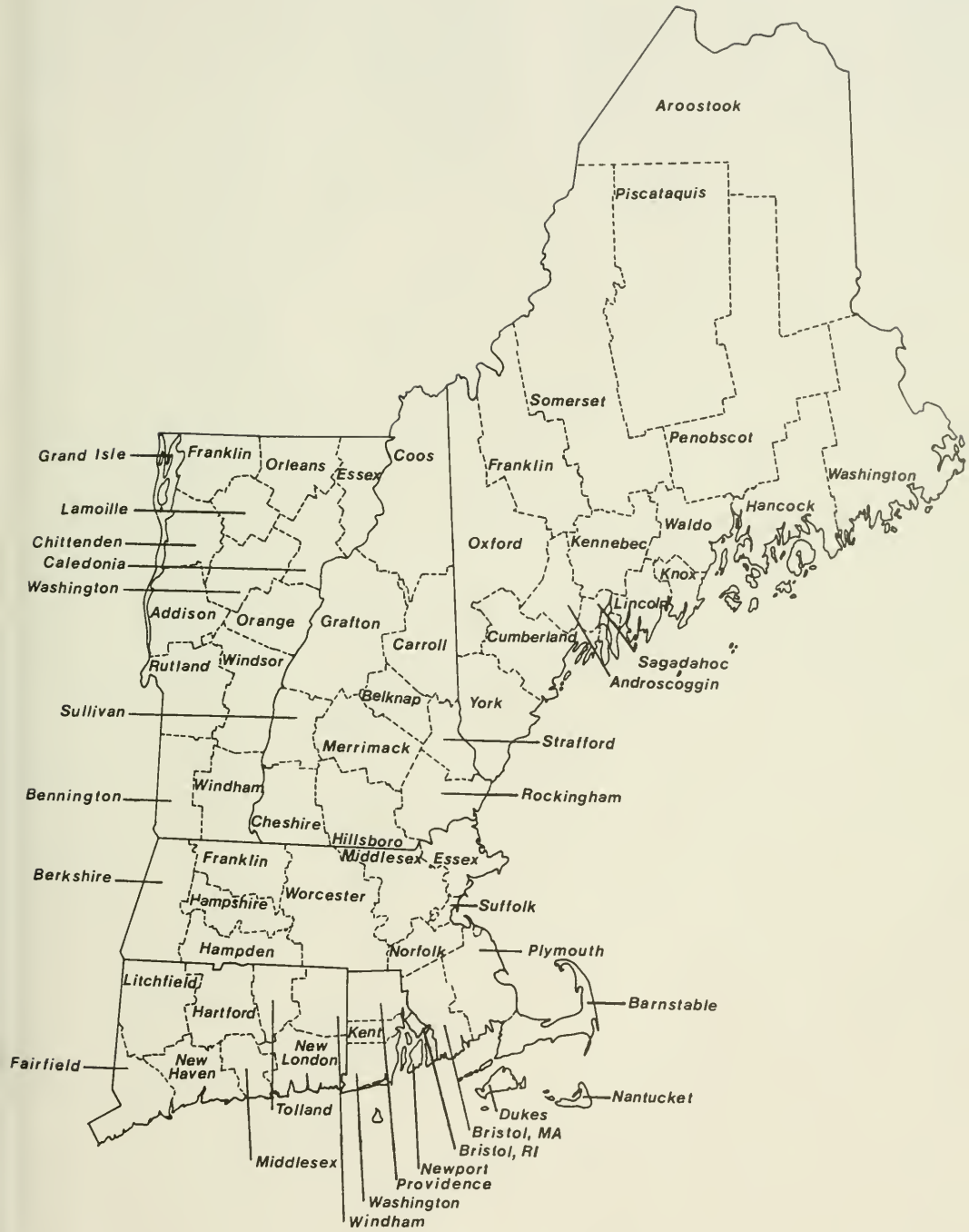
Aroostook
Piscataquis
Somerset
Penobscot
Franklin
Washington
Hancock
Waldo
Kennebec
Knox
Lincoln
Oxford
Cumberland
Sagadahoc
Androscoggin
York
Grand Isle
Franklin
Orleans
Essex
Coos
Lamoille
Chittenden
Caledonia
Washington
Addison
Orange
Grafton
Carroll
Rutland
Windsor
Belknap
Sullivan
Merrimack
Strafford
Windham
Bennington
Rockingham
Cheshire
Hillsboro
Middlesex
Essex
Berkshire
Franklin
Hampshire
Worcester
Suffolk
Hampden
Norfolk
Plymouth
Litchfield
Barnstable
Hartford
Kent
New London
New Haven
Fairfield
Nantucket
Dukes
Tolland
Bristol, MA
Bristol, RI
Middlesex
Newport
Providence
Washington
Windham